# *Semi-continuous metals monitoring in R5*
## Program benefits and future options
Motria Caudill, Sept. 10, 2015

# Routine method vs. NextGen

## Traditional filter-based metals sampling
- 24-hour integrated PM sample
- Weeks of waiting for lab results
- Typically ~60 samples per year on 1-in-6 day schedule
- Source apportionment difficult with complex meteorology
- Good for chronic exposure and multi-year studies

## Next generation semi-continuous monitor
- 1-hour sample for 23 metals and trace minerals
- Near real-time data via built-in XRF laboratory instrument
- Over 700 measurements per month or 8,000 per year
- Match data to hourly wind direction to help ID sources
- Quick decision making allows for earlier risk reduction

# Reel-to-reel metals filter tape
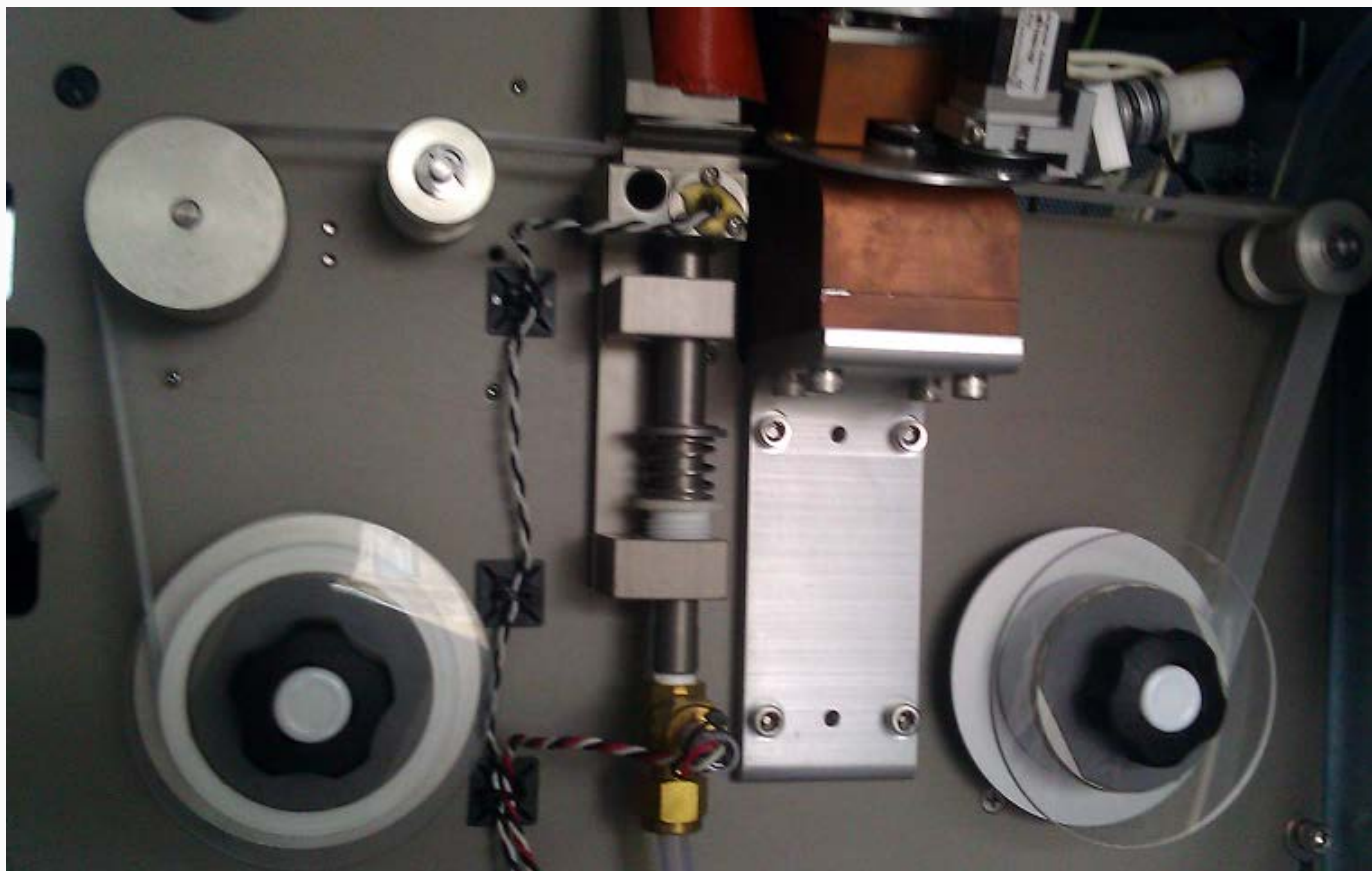
# Site deployment and O&M

- Our current approach: short-term (3-6 month) studies
- Advance visit(s) needed to secure site access and get a quote for electrical installation
- Every time we move the trailer, 3-5 days of staff time and $2-4K needed for electrical installation
- Once system is running, filter tapes are changed once every 3 weeks. Local monitoring agency can be trained to change tapes.
- Short-term option: to skip the complications of electrical set-up, can run the system for ~ $300/week on the diesel engine. The trailer has a >200 gallon tank.

# Example: Metal recycler, data show potential to violate Pb-NAAQS
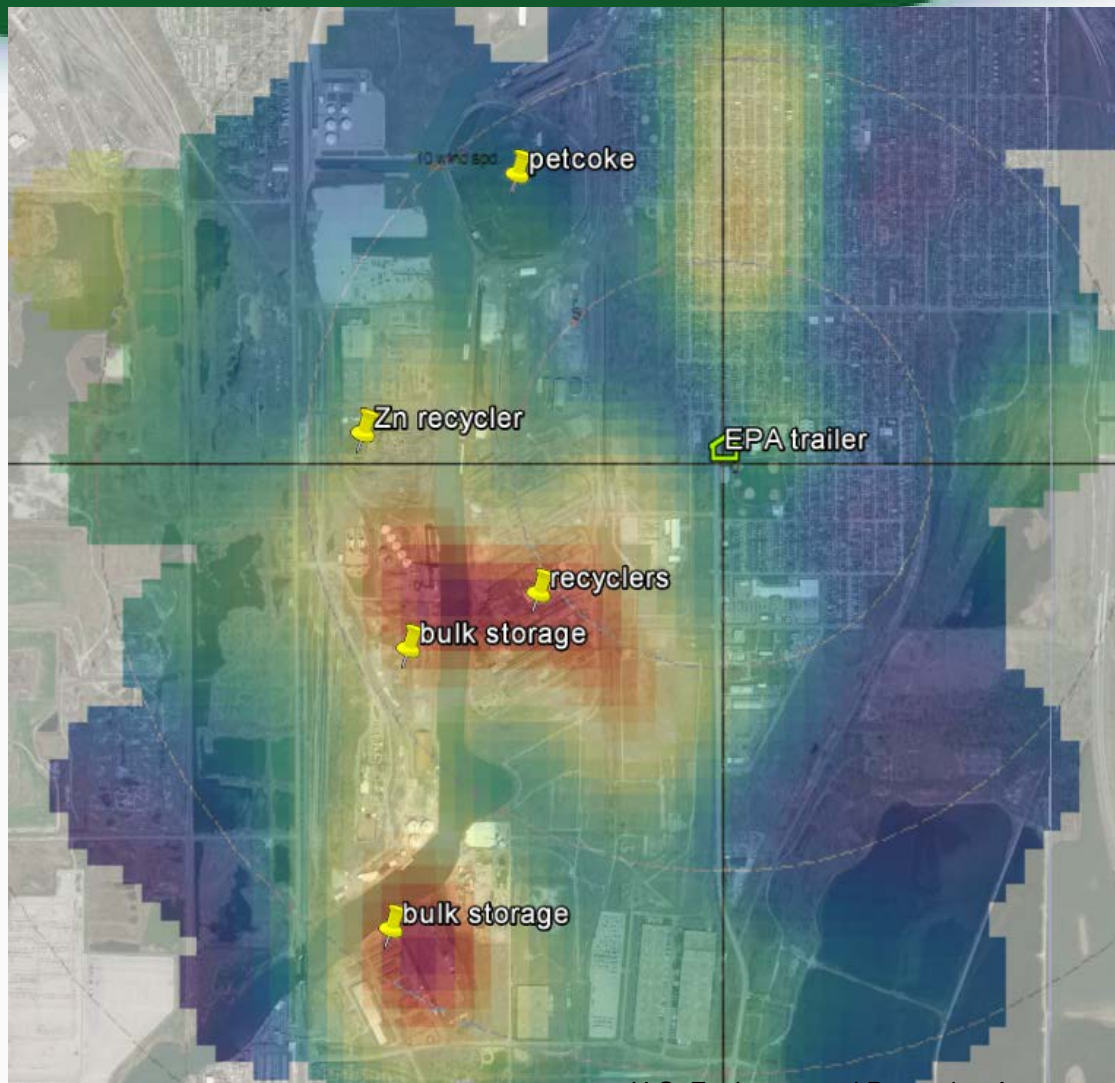


Pb percentile plot
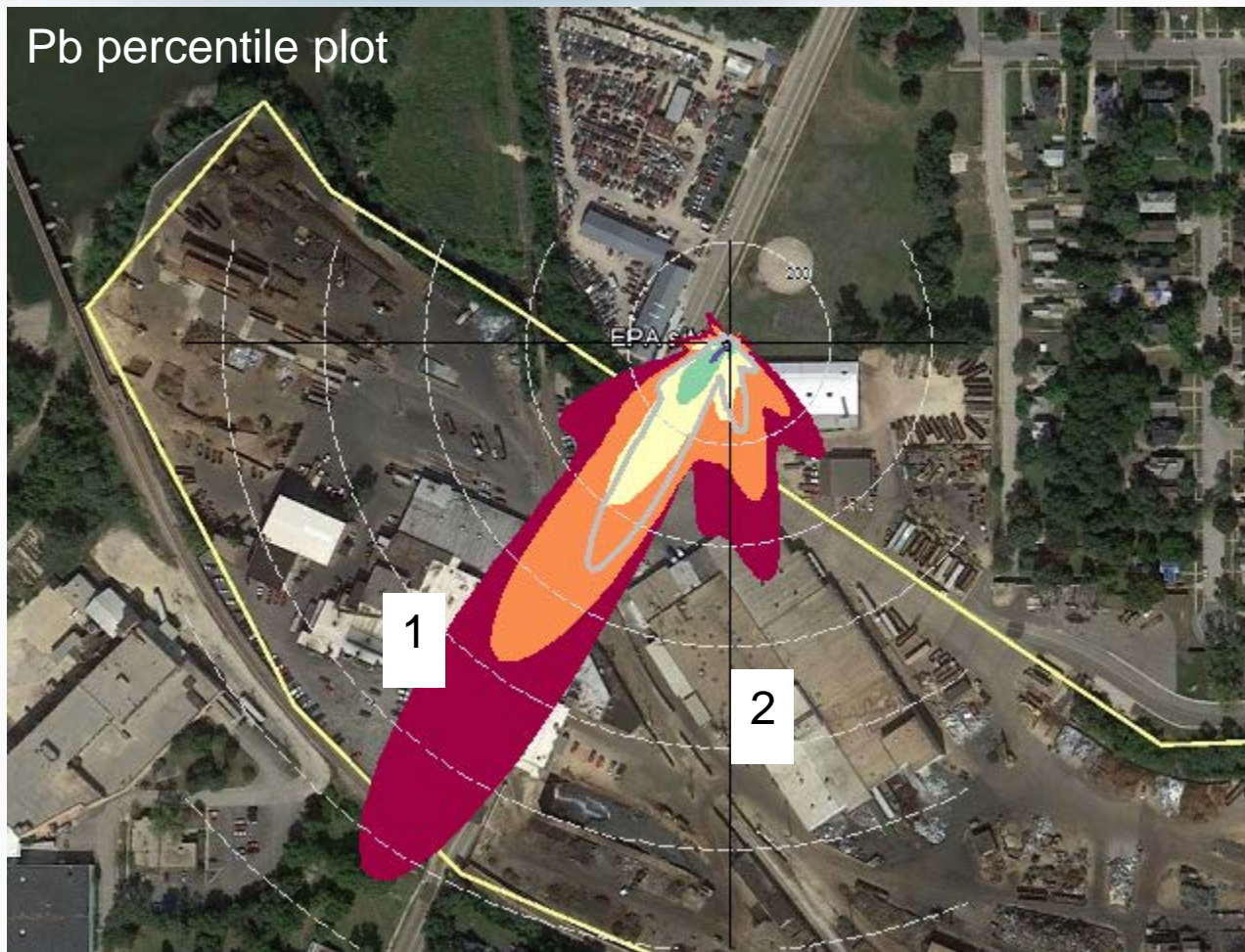
Points on map:
1. Originally targeted emissions point - furnace. This appears to be the main area of Pb & As emissions.
2. Secondary impacts from scrap shredder.

Follow up: long-term TSP-Pb monitoring

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# EJ community – multiple sources of Mn identified



petcoke

Zn recycler

EPA trailer

recyclers

bulk storage

bulk storage

Follow up: bulk storage facilities are required to develop PM fugitive emissions plans; one is installing baghouse

# Metals - next steps

- o We are pursuing options to collaborate with other EPA organizations and to share the expense for special studies – other Regions, OAPQS, ORD, OECA/NEIC, ATSDR, SLTs.

- o Plans for 2016 include using Xact for SLT studies:
  - o Michigan will deploy as part of air toxics local-scale grant at near-road sites
  - o Minnesota may investigate unknown Pb source in Twin Cities

# Next Generation Ambient Air Monitoring for Benzene and Toluene Compared with Traditional Methods at the Fenceline of an Indiana Oil Refinery

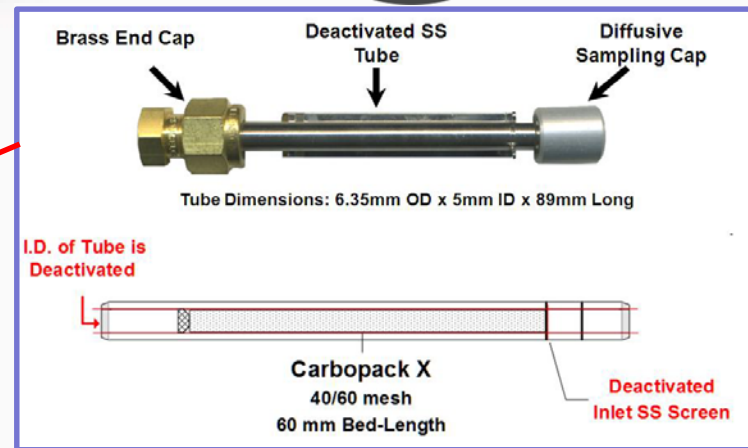Motria Caudill[1], Wayne Whipple[1], Karen Oliver[2], Donald Whitaker[2]

[1]EPA Region 5, [2]EPA Office of Research and Development

# Petroleum Refinery Sector Risk & Technology Review; New Source Performance Standards

o Additional emissions control requirements

o Application of a new air monitoring method to detect fugitive emissions

o EPA set an annual average benzene concentration standard at the refinery fence line, measured using 2-week integrated samples placed around the refinery fence line perimeter.

o ***Does the proposed monitoring method compare well with current procedures?***

# Proposed method – Passive tubes, collection via Modified Method 325A, analysis via Modified Method 325B



Brass End Cap    Deactivated SS Tube    Diffusive Sampling Cap

Tube Dimensions: 6.35mm OD x 5mm ID x 89mm Long

I.D. of Tube is Deactivated

Carbopack X
40/60 mesh
60 mm Bed-Length

Deactivated Inlet SS Screen

Thermal Desorption (TD) -GC-MS

# This study

o Follow-up to an initial feasibility study led by EPA's Office of Research and Development (ORD) and Regions 3, 5, 6, & 8: "Collaborative Evaluation of a Low-Cost Volatile Organic Compounds Passive Sampling Method & Analytical Laboratory Intercomparison".

o **Our objective is to quantify the comparability of the new passive tube method to EPA's recommended method for VOC sample collection – canisters.**

o Added benefit: we received permission to piggyback sampling on an existing fenceline network of autoGC stations at an Indiana refinery.
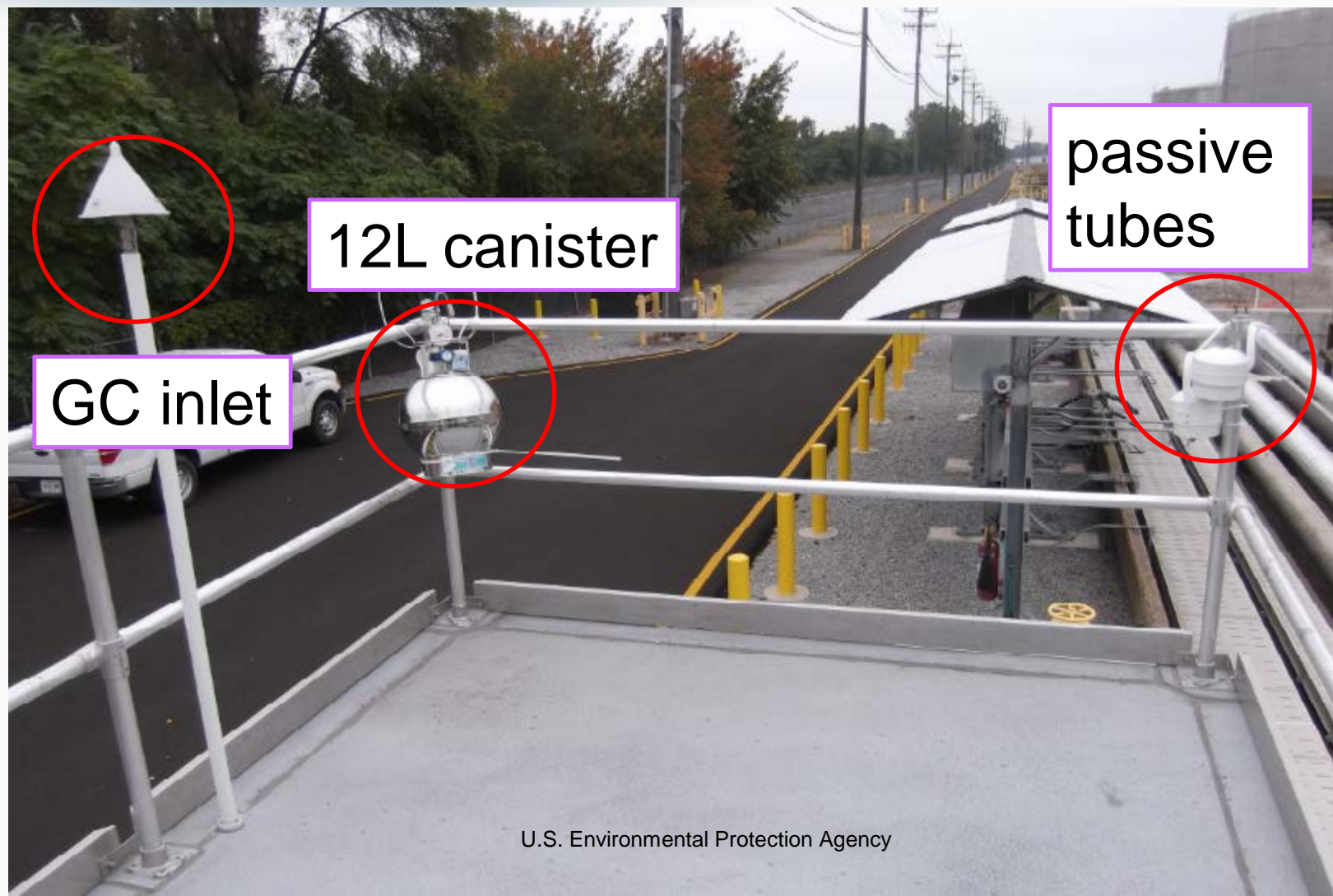
# BP Refinery, Whiting, Indiana



- Four-station fenceline network is result of 2012 agreement between refinery, regulators, & private citizen groups.

- BP committed to provide comprehensive air quality information regarding conditions at the fenceline via this public website:

http://raqis.radian.com/pls/raqis/bpw.whiting

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# We collected 8 sets of 1-week samples on top of GC trailers



passive tubes

12L canister

GC inlet

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# Challenge – different analytes

- CRL determined 60 VOCs in canisters
- ORD determined 9 VOCs in tubes
  - 1,3-butadiene
  - Benzene
  - Carbon tetrachloride
  - Toluene
  - PERC
  - Ethylbenzene
  - m,p-xylenes & o-xylenes
  - Styrene
- BP determines 4 via autoGC
- Only benzene and toluene are on all three lists

# Results

- 28 valid sets (of possible 32) 1-week paired canisters & tubes collected; analyzed at CRL and ORD, respectively
- Comparison methods
  - Plotted linear regression for full dataset
    - Correlation (R-squared), intercept, and slope
  - Calculated Relative Percent Difference (RPD) for each pair

$$\%RPD = \frac{(C_1 - C_2)}{\frac{(C_1 + C_2)}{2}} *100\%$$

# Benzene – Canister vs. Tube Regression
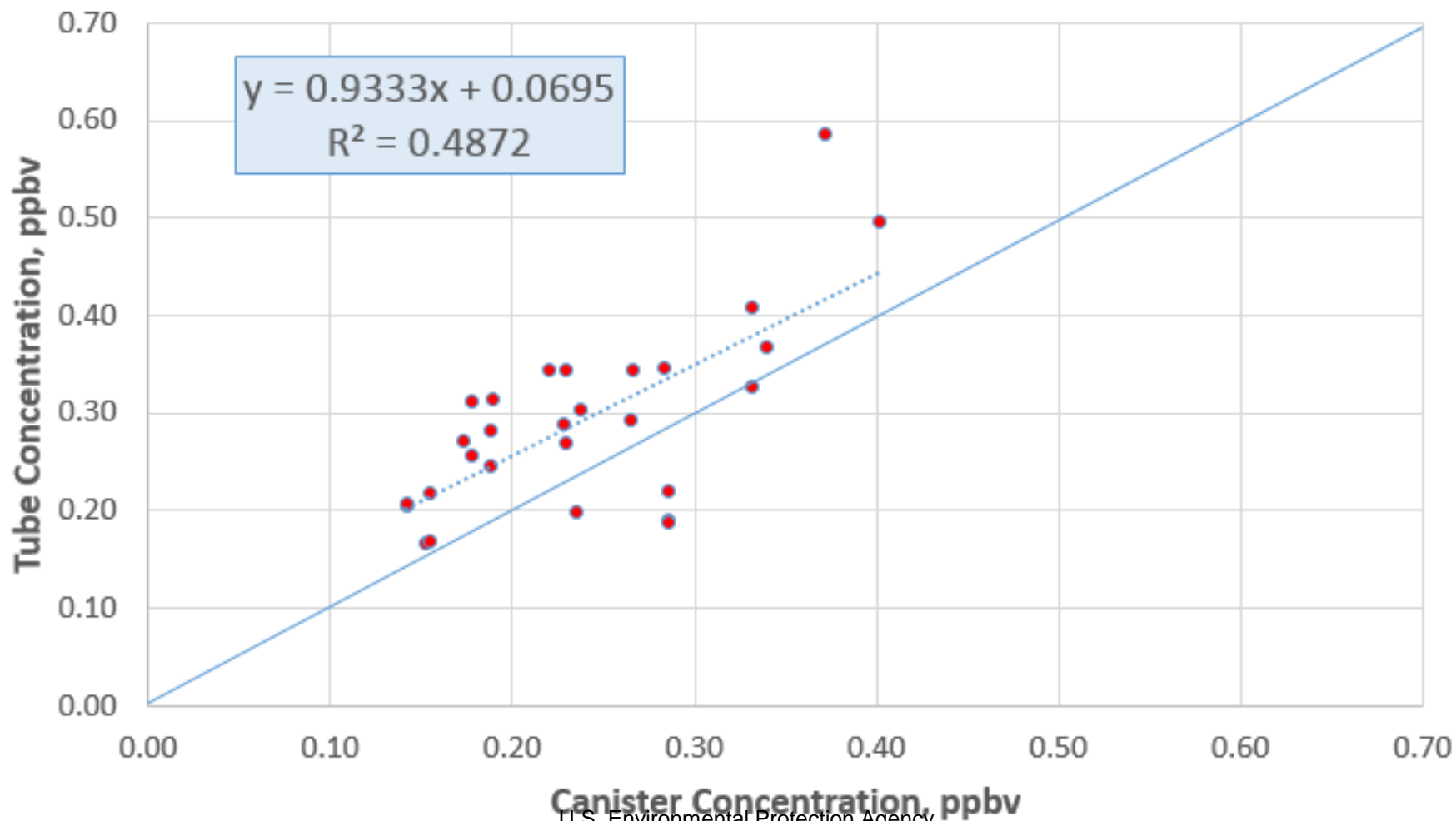
# Benzene and Toluene – Canister vs. Tube RPD



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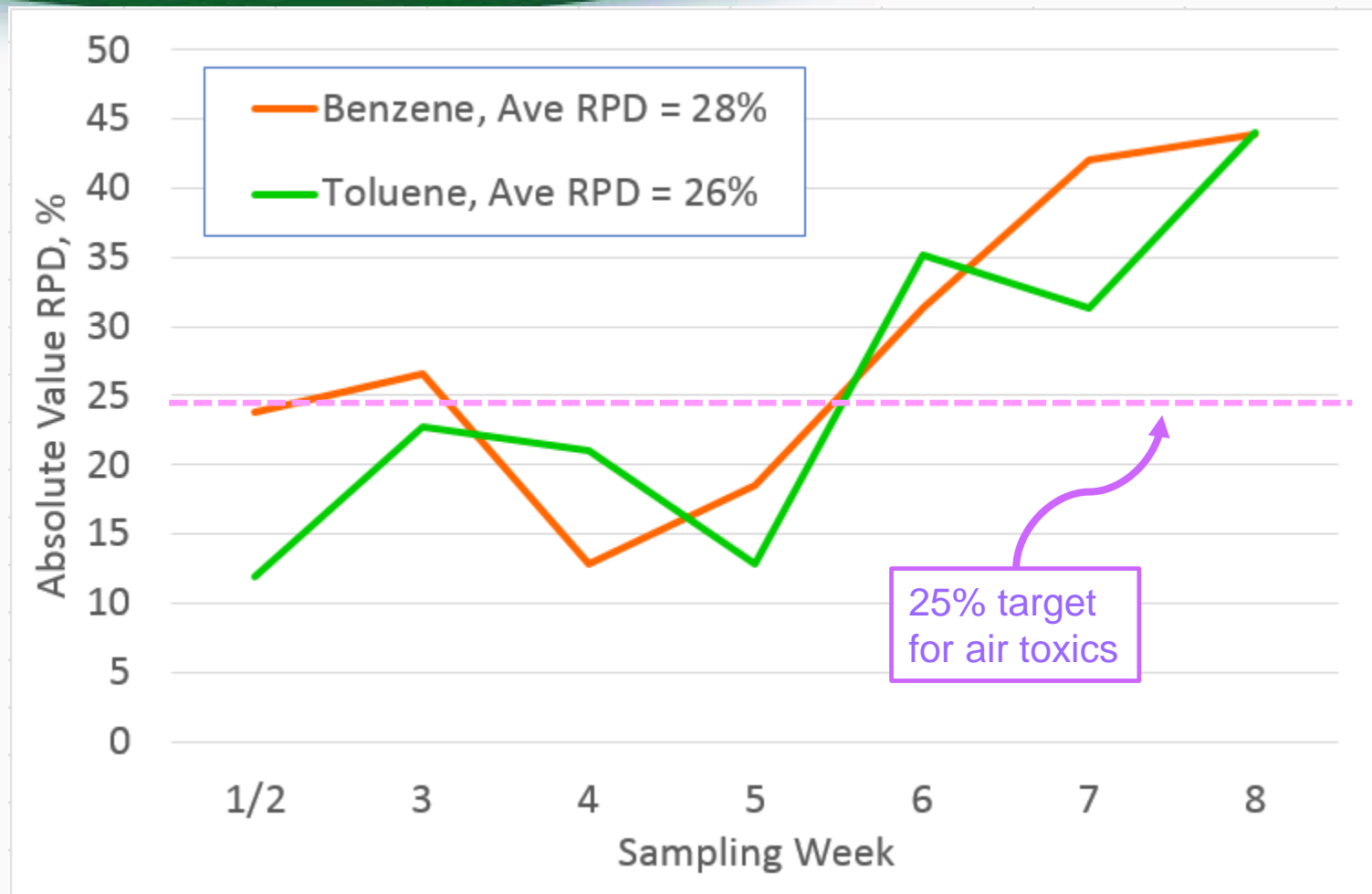
# Conclusions

o  All three VOC monitoring methods compared within reasonable limits for both benzene and toluene.

o  Duplicate tubes had excellent agreement (<3% diff).

o  More field testing is recommended to confirm that these relationships hold up during extreme summer and winter weather conditions.

o  Passive tubes could be used in variety of short-term studies with minimal infrastructure required.